**COURSE SYLLABUS**

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| **Subject: Surfaces and interfaces of Materials** | **Academic field: Materials Science and Nanotechnology** |
| **Lecturer: Thi Thu VU** |  |
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| **Academic year: 2015 - 2016** |  |

**COURSE DESCRIPTION**

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| **Credit points** | 3 |
| **Level** | Bachelor 2 |
| **Teaching time** **Location** | ?????University of Science and Technology of Hanoi |
| **Time Commitment** | Lecture | 30 hrs |
| Tutorial | 0 hrs |
| Practice | 0 hrs |
| Lab-work | 0 hrs |
| Total | 30 hrs |
| **Prerequisites** | Chemistry, solid-state-physics, Materials Characterization Techniques |
| **Recommended background knowledge** | Chemistry, solid-state-physics, Materials Characterization Techniques |
| **Subject description:** | The aim of this course is to present fundamental, elaboration and characterization techniques of surfaces and interfaces of materials  |
| **Objectives & Out-come** | Upon completion of this course, a student should be able to:* Understand fundamental phenomena at surfaces and interfaces of materials
* Know basic techniques to elaborate solid/solid, solid/liquid, liquid/liquid interfaces
* Know basic techniques to characterize solid/solid, solid/liquid, liquid/liquid interfaces
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| **Assessment/ Evaluation** | Attendance/Attitude | 20 % |
| Class exercise(s) | 0 % |
| Assignment(s) | 0 % |
| Report(s) | 0 % |
| Mid-term test | 30 % |
| Final exam | 50 % |
| **Prescribed Textbook(s)** | Handbook of Surfaces and Interfaces of Materials – H.S. Nalwa, Academic Press, 2001 |

**COURSE CONTENTS & SCHEDULE**

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| **Class**  | **Contents** | **Hours** | **Ref./Resources** | **Assignment(s)**  |
| **Lect.** | **Exr.** | **Prc.** |
| 1 | **1. Surface and interface phenomena**1.1. Fundamental concepts1.2. Microstructure and properties of interfaces between dissimilar materials1.3. Thermal oxidation of silicon and Si-SiO2 interface morphology, structure and localized state1.3. Surfactant adsorption layers at liquid-fluid interfaces1.4. Isothermal diffusion and intra-diffusion in surfactant solutions1.5. Catalysis by supported metal oxides | 6 | 0 | 0 |  |  |
| 2 | **2. Surface and interface analysis and properties**2.1. Composition structure and topography2.2. Dynamic surface tension and surfactant mass transfer kinetics2.3. Application of photoelectron spectroscopy in inorganic and organic material systems2.4. Spectroscopic characterization of oxide/oxide interfaces2.5. Photonic and electronic spectroscopies for the characterization of organic surfaces and organic molecules adsorbed on surfaces2.6. Visualization of polymers at surfaces and interfaces with atomic force microscopy | 6 |  | 0 |  |  |
| 3 | **3. Nanostructured materials, micelles, and colloids**3.1. Nanostructured metal clusters and colloids3.2. Nanoparticle thin films : an approach based on self-assembly3.3. Assembly of colloidal particles into nanostructured materials and microscopic devices3.4. Thin film nanofabrication by alternate adsorption of polyions, nanoparticles, and proteins3.5. Core-shell nanoparticles and assemblies thereof3.6. Crystalline nanoparticles in glasses for optical applications | 6 | 0 | 5 |  |  |
| 4 | **4. Solid thin film and layers**4.1. Langmuir-Blodgett and self-assembled polymeric films4.2. Morphological and structural aspects of thin films prepared by vapour deposition4.3. Elaboration of polymer brushes towards life science | 6 | 0 |  |  |  |
| 5 | **5. Biomolecules, biointerfaces and applications**5.1. Interfacial and materials aspects of the immobilization of biomolecules onto solid surfaces5.2. Thin films on electrodes for direct protein electron transfer5.4. Molecular organization of peptides and their function5.6. Conducting polymer-based Schottky barrier and heterojunction diodes and their sensor application | 6 | 0 | 0 |  |  |

*Notes:*

* *Abbreviation: Lect. (lecture), Exr. (Exercise), Prc. (Practise).*
* *Assignments may include assignments, practical work, reports, exercises ...for each class sessions*